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EXAMINER	
PROCTOR, JASON SCOTT	

ART UNIT	PAPER NUMBER
2123	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/016,619	NETEMEYER ET AL.	
	Examiner	Art Unit	
	Jason Proctor	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 December 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims 1-15 have been presented for examination.

Claims 1-15 have been rejected.

Priority

The Examiner acknowledges Applicants' claim for priority to US Provisional Application 60/258,999 filed on December 29, 2000.

Specification

1. The use of several trademarks, including at least Simula® and Eiffel™, has been noted in this application. They should be capitalized wherever they appear and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

Information Disclosure Statement

2. Applicant is respectfully reminded of the duty to disclose under 37 CFR 1.56. Specifically, the Examiner suggests considering the material presented on the information disclosure statements submitted with copending case 10/020,033, by the same inventors, as well as the results of the international search report for PCT application PCT/US01/48038.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 10-15 are rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter.

MPEP 2106 reads as follows:

> The claimed invention as a whole must accomplish a practical application. That is, it must produce a "useful, concrete and tangible result." *State Street*, 149 F.3d at 1373, 47 USPQ2d at 1601-02. The purpose of this requirement is to limit patent protection to inventions that possess a certain level of "real world" value, as opposed to subject matter that represents nothing more than an idea or concept, or is simply a starting point for future investigation or research (*Brenner v. Manson*, 383 U.S. 519, 528-36, 148 USPQ 689, 693-96); *In re Ziegler*, 992, F.2d 1197, 1200-03, 26 USPQ2d 1600, 1603-06 (Fed. Cir. 1993)). Accordingly, a complete disclosure should contain some indication of the practical application for the claimed invention, i.e., why the applicant believes the claimed invention is useful.

4. Claim 10 recites a method that fails to produce a tangible result. A "mathematical simulation" is not limited to producing a tangible result. The Examiner respectfully suggests claiming the invention as producing some tangible output, such as displaying results of the

simulation, or as achieving some physical transformation outside of the computer, such as controlling the facility network, as appropriate.

Claim 13 is rejected for similar reasons. The step of "simulating as a function of time the transport phenomena" does not produce a tangible result. The recited steps are abstract and therefore not limited to the technological arts.

MPEP 2106 reads as follows:

> Similarly, computer programs claimed as computer listings *per se*, i.e., the descriptions or expressions of the programs, are not physical "things." They are neither computer components nor statutory processes, as they are not "acts" being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer which permit the computer program's functionality to be realized. In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. Accordingly, it is important to distinguish claims that define descriptive material *per se* from claims that define statutory inventions.

5. Claims 14 and 15 define a computer software architecture and are therefore nonfunctional descriptive material. Claim 14 recites "an object-oriented software architecture" which is abstract, intangible, and performs no method. Claim 15 recites additional limitations of the abstract, intangible "software architecture."

MPEP 2106 reads as follows (emphasis added):

> Both types of "descriptive material" are nonstatutory when claimed as descriptive material *per se*. *Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759. When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure *per se* held nonstatutory). <u>When nonfunctional descriptive material is recorded on some computer-readable medium, it is not statutory since no requisite functionality is present to satisfy the practical application requirement. Merely claiming nonfunctional descriptive material stored in a computer-readable medium does not make it statutory. Such a result would exalt form over substance.</u>

> *In re Sarkar*, 588 F.2d 1330, 1333, 200 USPQ 132, 137 (CCPA 1978) ("[E]ach invention must be evaluated as claimed; yet semantogenic considerations preclude a determination based solely on words appearing in the claims. In the final analysis under 101, the claimed invention, as a whole, must be evaluated for what it is.") (quoted with approval in *Abele*, 684 F.2d at 907, 214 USPQ at 687). See also *In re Johnson*, 589 F.2d 1070, 1077, 200 USPQ 199, 206 (CCPA 1978) ("form of the claim is often an exercise in drafting"). Thus, nonstatutory music is not a computer component and it does not become statutory by merely recording it on a compact disk. Protection for this type of work is provided under the copyright law.

6. Claims 14 and 15 are directed to an abstract software architecture and are therefore nonstatutory. Amending these claims to incorporate the software architecture onto a computer-readable medium will not make the claimed inventions statutory because there is no functionality recited by these claims. A software architecture is not a software program; it is a representation of the abstract structure of a software program.

7. Additionally, claim 15 makes reference to limitations such as a "WmSystem controller class", a "Case class", and a "ValueUse class" which specifically refer to computer software *per se* as depicted in Fig. 2. Computer software is not statutory subject matter that can be protected by US Patent. The Examiner respectfully suggests claiming Applicants' invention as a computer system comprising software with limitations that refer to the methods performed by the software rather than referring to the particular software by name.

To expedite a complete examination of the instant application the claims rejected under 35 U.S.C. § 101 (nonstatutory) above are further rejected as set forth below in anticipation of applicant amending these claims to place them within the four statutory categories of invention.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 1-9 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

MPEP 2164.01(a) lists several factors that can contribute to the determination whether experimentation is "undue". These factors include, but are not limited to:

- The state of the prior art;
- The nature of the invention;
- The level of one of ordinary skill;
- The existence of working examples; and
- The quantity of experimentation needed to make or use the invention based on the content of the disclosure.

The limitation of "the extensible class hierarchy permitting the addition of additional object types and additional member variables without any modifications to the class hierarchy itself" prevents a person of ordinary skill in the art from making and using the invention. The state of the prior art is such that existing programming languages that support object-oriented programming by various implementations define a class hierarchy according to the class types. The class hierarchy is a representation of the existing object types. The addition of new object

types to the hierarchy, through inheritance, derivation, or some other equivalent, necessarily changes that class hierarchy. Evidence of working examples of programming languages that exhibit this behavior would be appreciated.

The nature of the invention is a means for simulating transport phenomena such as extracting oil from a subterranean hydrocarbon-bearing reservoir, not directly related to programming language design. In order to make and use the invention as claimed, a person of ordinary skill in the art would be required to invent an undisclosed programming language that facilitates this particular behavior.

The act of designing computer programming languages is highly complex, undertaken almost exclusively by highly educated experts in that specific field, and often requires a prohibitive investment in time and money. Programming languages such as Ada have gone through numerous versions throughout the years, and are referred to as Ada95 (1995), Ada83 (1983), and so on.

As a result of these considerations, undue experimentation would be required to make and use the claimed invention wherein "the extensible class hierarchy" would permit "the addition of additional object types and additional member variables without any modifications to the class hierarchy itself".

Claims rejected but not specifically mentioned stand rejected by virtue of their dependence.

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claim 7 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 presents several difficulties that render the scope of the claim indefinite. It is unclear whether the recitation of "additional data member types" is intended to refer to the "first set of generic classes representing a plurality of object types" from claim 1, the "second set of generic classes representing member variables for the object types" from claim 1, or represents something else entirely. It is unclear whether "additional facility data members" refers to "additional data members" as recited earlier in the claim. The claim recites "the user" which lacks sufficient antecedent basis. It is unclear whether the later recitation of "a user" presents a second user or if it refers to "the user". The Examiner notes that the language of claim 6 appears to be more related to that of claim 6 than of claim 1.

Claims rejected but not specifically mentioned stand rejected by virtue of their dependence.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 1, 8-9, and 14 are rejected under 35 U.S.C. § 102(b) as being anticipated by "The C++ Programming Language, Third Edition" by Bjarne Stroustrup (1997).

Regarding claim 1, Stroustrup discloses a computer programming language that implicitly discloses the use of a modern computer system comprising memory means, storage means, and software created using the C++ programming language.

Stroustrup discloses a class hierarchy (page 735, either figure) comprising a first set of generic classes representing a plurality of object types (example: *Car* or *Truck*) and a second set of generic classes representing member variables for the object types [*"The 'plain' cars and trucks are initialized with* ***Vehicle::eptr*** *zero; the others are initialized with* ***Vehicle::eptr*** *nonzero."* (page 736) Also, example: *Police_car*, class definition of *Police_car*] and wherein the hierarchy is designed to be expanded as necessary [section 24.3.2.1 Dependencies within a Class Hierarchy; *"If, however, the intent is to provide a framework into which a later programmer can add code, then virtual functions are often an elegant mechanism for achieving this..."* (page 738)].

The use of the object-oriented extensible class hierarchy for the storage of transport phenomena simulation data is regarded as intended use. Stroustrup discloses the use of the extensible class hierarchy for the storage of vehicle data (page 738). MPEP 2111.02 reads as follows:

> If a prior art structure is capable of performing the intended use as recited in the preamble, then it meets the claim. See, e.g., *In re Schreiber*, 128 F.3d 1473, 1477, 44 USPQ2d 1429, 1431 (Fed. Cir. 1997) (anticipation rejection affirmed based on Board's factual finding that the reference dispenser (a spout disclosed as useful for purposes such as dispensing oil from an oil can) would be capable of dispensing popcorn in the manner set forth in appellant's claim 1 (a dispensing top for dispensing popcorn in a specified manner)) and cases cited therein. See also MPEP § 2112 - § 2112.02.

Although the intended use is not recited by the preamble, the body of the claim is directed toward the structure of the extensible class hierarchy and thus defines the intended use for that hierarchy. The class hierarchy of Stroustrup is clearly capable of performing the intended use as stated, for example, by replacing the vehicle data with transport phenomena simulation data, and therefore meets the claim.

Regarding claim 8, Stroustrup discloses software written in C++ (pages 732-733).

Regarding claim 9, Stroustrup discloses a hierarchy of logically related data (page 735, either figure, corresponding implementation illustrated on page 736).

The Authoritative Dictionary of IEEE Standards Terms, Seventh Edition, provides the following definition relied upon for this rejection:

database A collection of logically related data stored together in one or more computerized files.

Regarding claim 14, Stroustrup discloses an object-oriented software architecture (pages 732-733).

Stroustrup discloses a hierarchy of classes (page 735, either figure).

Stroustrup discloses derived classes (page 737).

Stroustrup discloses that classes contain member variables of various primitive types (pages 224-227, i.e. *class Date* (page 227) contains integers *d, m,* and *y*).

Stroustrup discloses that classes have a many-to-one relationship with the base class. This is known as the concept of instance classes, which can be created as necessary to implement the program. This creates many instances that are all related to the same base class.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 2-5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Stroustrup as applied to claim 1 above, and further in view of US Patent No. 6,038,389 to Rahon et al. (Rahon).

Stroustrup does not expressly teach the details of Applicants' particular intended use, although the class hierarchy of Stroustrup is capable of performing the intended use of claims 2 through 4.

Rahon teaches a method of modeling a physical process in a material environment (abstract) with an exemplary use of a hydrocarbon reservoir. Rahon models the transport phenomena [*"Pumping has been simulated during 86,400 seconds (1 day), with a flow rate of 30 m^3/day."* (column 6, lines 48-50); *"FIG. 1* [a graph of kPa at t(s) (pressure dependent on time)]

compares the values obtained by means of the method according to the invention to the values obtained by means of a conventional time division type method... " (column 6, lines 51-64)].

It would have been obvious to a person of ordinary skill in the art at the time of Applicants' invention to combine Rahon's method of modeling a physical process, such as the transport phenomena in a hydrocarbon reservoir through a well to the earth's surface, with the class hierarchy capable of storing data as taught by Stroustrup. The combination could be achieved by representing the various components of Rahon's model [*grid pattern, well, pumping,* etc. (column 6, lines 42-50)] as the objects (storing the appropriate simulation data) and methods of a class hierarchy as taught by Stroustrup. Motivation to do so is explicitly taught by Stroustrup, such as an enhanced ability to understand how the model works [*"The point about modeling reality is not to slavishly follow what we see but rather to use it as a starting point for design, a source of inspiration, and an anchor to hold on to when the intangible nature of software threatens to overcome our ability to understand our programs."* (page 734)].

Regarding claims 3 and 4, Rahon teaches a transport pathway including a well and, by modeling pumping, implicitly teaches modeling a pump (column 6, lines 40-50). The combination and motivation to combine are the same as those for claim 2. A pump and a well constitute a facility network through which hydrocarbon fluids are transported between the subsurface reservoir and the delivery locations.

Regarding claim 5, the specification defines a "Data Definitions File":

> In the current system, clear-text file, for example, an ASCII file, which can be referred to as a "Data Definitions File" contains text entries that define each facility type and all of the attribute values for each facility type. (page 16, lines 28-31)

Stroustrup teaches a clear-text file that contains text entries that define each object type and all of the attribute values for the objects (excerpts shown on page 736, 737, et cetera), which are generally referred to in the art of software engineering as "class definitions" in "source code" (see pages 33-34).

12. Claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Stroustrup as applied to claim1 above, and further in view of US Patent No. 6,842,725 to Sarda.

Regarding claim 6, Stroustrup does not expressly teach the graphical user interface.

Sarda teaches a method for modeling fluid flows in a hydrocarbon reservoir (column 2, lines 5-18). Sarda teaches a user interface wherein a user defines the specific well network for the reservoir [detailed description, section 5, "Simulation input data", *"The data relative to the well are: its geometry, in the form of a series of connected segments*[, and] *the imposed flow rates, in the form of a curve giving the imposed flow rate as a function of time."* (column 8, lines 28; 53-59)]. Sarda teaches a graphical interface concerning the well [*"A well is a series of connected segments that intersect the network fractures. The geometric representation of a well is therefore a 3D broken line."* (column 5, lines 60-63)]. Sarda both suggests and implies the use of a graphical user interface for defining the specific network of wells and facility objects to simulate transport phenomena into and out of a specific hydrocarbon-bearing reservoir.

It would have been obvious to a person of ordinary skill in the art at the time of Applicants' invention to combine the teachings of Sarda regarding graphical modeling of fluid flows, specifically including a model of a well as a series of connected segments, with the object

oriented software design taught by Stroustrup. The combination could be achieved by representing the various components of Sarda's model (segments of the well, nodes of the mesh, et cetera) as objects in a class hierarchy. Motivation to do so is explicitly taught by Stroustrup, such as an enhanced ability to understand how the model works [*"The point about modeling reality is not to slavishly follow what we see but rather to use it as a starting point for design, a source of inspiration, and an anchor to hold on to when the intangible nature of software threatens to overcome our ability to understand our programs."* (page 734)].

13. Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Stroustrup as applied to claim 1 above, and further in view of "Design Patterns: Elements of Reusable Object-Oriented Software" by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides (Vlissides, 1995).

Regarding claim 7, Stroustrup does not expressly teach a graphical user interface through which a user can define additional data members.

Vlissides teaches a design pattern for object-oriented software called the "Factory Method" (page 107) wherein an exemplary use is shown (page 107) depicting, in flowchart form, a user interface wherein a user of a computer system can create additional data objects (*Documents*) by using a graphical user interface. Vlissides shows an exemplary "user customized" data member [*MyApplication*] that contains its own user-customized *CreateDocument()* member function.

It would have been obvious to a person of ordinary skill in the art at the time of Applicants' invention to combine the Factory Method design pattern taught by Vlissides, especially in light of Vlissides' examples, with the object-oriented programming language taught by Stroustrup to achieve a graphical user interface through which a user can define additional data members. The combination could be achieved by using a user-customized *CreateFacility()* function, wherein the nature of the problem to be solved would motivate a person of ordinary skill in the art to customize that function to the particular intended use at hand. Motivation to combine is expressly taught by Vlissides [*"Use the Factory Method pattern when: a class can't anticipate the class of objects it must create; a class wants its subclasses to specify the objects it creates; classes delegate responsibility to one of several helper subclasses, and you want to localize the knowledge of which helper subclass is the delegate."* (page 108) All these reasons relate directly to customization of the classes at a later point in time.].

14. Claims 10-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sarda.

Regarding claim 10, Sarda teaches a method for modeling fluid flows in a hydrocarbon reservoir (column 2, lines 5-18) including a facility network [*"A well is a series of connected segments that intersect the network fractures. The geometric representation of a well is therefore a 3D broken line."* (column 5, lines 60-63)]. Sarda teaches a user interface wherein user specifies values of the member variables for each facility [detailed description, section 5, "Simulation input data", *"The data relative to the well are: its geometry, in the form of a series of connected segments*[, and] *the imposed flow rates, in the form of a curve giving the imposed*

flow rate as a function of time." (column 8, lines 28; 53-59)]. Sarda teaches using the specified values in a mathematical simulation of transport phenomena within the facility network as a function of time [*"In order to simulate a well test, whatever the medium, this equation has to be solved in space and in time. Discretization of the reservoir (mesh pattern) is therefore performed and solution of the problem consists in finding the pressures of the meshes with time, itself discretized in a certain number of time intervals."* (column 2, lines 24-47)].

It would have been obvious to a person of ordinary skill in the art to implement the model taught by Sarda in object-oriented software because the advantages of object-oriented software are well known to persons of ordinary skill. See, for example, Stroustrup.

Regarding claim 11, Sarda teaches that the facility network is part of a larger simulation model, with said facility network being capable of exchanging fluids with at least one other part of the simulation model [fluid from the reservoir is transferred via the series of connected segments that form the facility network of the well (column 2, lines 55-67)].

Regarding claim 12, Sarda teaches that the simulation model comprises a facility network [*"A well is a series of connected segments that intersect the network fractures. The geometric representation of a well is therefore a 3D broken line."* (column 5, lines 60-63)] and a hydrocarbon-bearing formation [*"Discretization of the reservoir (mesh pattern) is therefore performed and solution of the problem consists in finding the pressures of the meshes with time, itself discretized in a certain number of time intervals."* (column 2, lines 43-47)].

15. Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent No. 6,434,435 to Tubel et al. (Tubel) in view of Sarda.

Regarding claim 13, Tubel teaches an object-oriented software for control of a hydrocarbon production system (column 1, lines 14-50). Although Tubel is primarily concerned with the control of such a system, the disclosed invention can also perform in a simulation mode [*"...in the simulation mode, simulated and/or calculated sensor and actuator data may be used in place of data from real-world sensors and actuators. Simulation of real or abstract systems occurs by having an ISO 10 evaluate or interrogate a model of a real or abstract thing or system or evaluate and/or interact with rules associated with the real or abstract thing."* (column 12, lines 6-18)].

Tubel teaches a controlling (and therefore simulating) a hydrocarbon-bearing reservoir penetrated by a plurality of wells and surface facilities connected to the wells [*"...the present invention relates to management of hydrocarbon production from a single production well (e.g., only well 642) or from a group of wells, shown in FIG. 28 as well 640, well 641, and well 642."* (column 23, lines 8-15); *"Referring still to FIG. 28, as is well known in the art a given well may be divided into a plurality of separate zones, such as zone 640a, zone 640b, and zone 640c. Such zones may be positioned in a single vertical well such as well 640 assocaited with surface platform 645, or such zones may result when multiple wells are linked or otherwise joined together (not shown in FIG. 28)."* (column 26, lines 52-58, emphasis added)].

Tubel teaches using objects and variables in a class hierarchy to model the wells and surface facilities [*"Referring now to FIG. 30, a diagrammatic representation of ISOs 10 in flow*

and hierarchical relationships, ISOs 10 can model and represent any device or group of devices including sensors 200, controllable devices 300, fluid processing devices 400, injection devices 500, or any combination thereof. ISOs 10 can also model and represent more abstract processes such as a single zone like 640a, a group of zones such as 640 a and 640b, an entire well such as well 640, or an entire field such as wells 640, 641, and 642." (column 25, lines 23-31)].

Tubel does not teach discretizing the reservoir into a plurality of volumetric cells, each modeled as nodes, and simulating the exchange of fluid between those nodes.

Sarda teaches discretizing the reservoir into a mesh pattern (consisting of interconnected nodes) used to model the reservoir by finding the pressure of the oil contained therein as a function of time (column 2, lines 24-47). In this method, the model simulates the flow of fluid through a porous medium, accounting for the real geometry of the fracture network (found in the reservoir) and thus simulates the interactions between the pressure and flow rate variations in a well running across the medium (column 2, lines 55-67). Sarda teaches specifying initial conditions for each node and connection (column 4, lines 33-64).

It would have been obvious to a person of ordinary skill in the art at the time of Applicants' invention to combine Sarda's method for modeling the flow of fluid in a reservoir with Tubel's object-oriented method of modeling a facility network. The combination could be achieved by operating Tubel's method in simulation mode, wherein the data calculating the transport phenomena of the underground reservoir is supplied by Sarda's method and delivered to the sensors and actuators modeled by Tubel. Motivation to combine would be found in the knowledge of a person of ordinary skill in the art as well as the nature of the problem to be solved; Tubel's simulation mode requires calculated sensor and actuator data while the results of

Sarda's model provide an efficient and accurate representation of the transport phenomena that would be detected by Tubel's sensors.

16. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stroustrup as applied to claim 14 above.

Claim 15 recites various named components of object-oriented software that would have been obvious to a person of ordinary skill in the art when confronted with a particular problem. The claim does not positively recite the functionality performed by these classes. Stroustrup (page 735) teaches such components, such as the "Car" class that has a relationship to the base class "Vehicle". The "Emergency" class can be used by objects of the "Car" class, specifically "Police_car" and "Ambulance".

Conclusion

Art considered pertinent by the examiner but not applied has been cited on form PTO-892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Proctor whose telephone number is (571) 272-3713. The examiner can normally be reached on 8:30 am-4:30 pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached at (571) 272-3749. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-3713.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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7/1/05

Paul L. Rodriguez
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